

WHAT IS CLAIMED IS:

1. A nitride semiconductor device comprising:
a semiconductor layer;

5 a first electrode for establishing an ohmic contact disposed on the semiconductor layer, the first electrode including an upper layer and a lower layer and being subjected to heat treatment; and

a second electrode formed on the first electrode, the second
10 electrode having a different shape from a shape of the first electrode, the second electrode further including an upper layer and a lower layer,

wherein the upper layer of the first electrode and the lower layer of the second electrode comprise an element of the platinum
15 group and form a joint region joining the first electrode to the second electrode.

2. A nitride semiconductor device according to claim 1,
wherein the lower layer of the first electrode comprises a
20 material which is alloyable by heat treatment.

3. A nitride semiconductor device according to claim 1,
wherein the upper layer of the first electrode comprises an
elemental metal of the platinum group or an alloyed material
25 essentially composed of homologous elements in the platinum group.

4. A nitride semiconductor device according to claim 1,
wherein the lower layer of the second electrode comprises an
elemental metal of the platinum group or an alloy including at
5 least one of the platinum group metals.

5. A nitride semiconductor device according to claim 1,
wherein the upper layer of the first electrode comprises Pt.

10 6. A nitride semiconductor device according to claim 1,
wherein the lower layer of the second electrode comprises Pt.

7. A nitride semiconductor device according to claim 1,
wherein the surface of the semiconductor layer on which the first
15 electrode is formed comprises an electrode formation region and
an insulating layer formation region and the second electrode
overlies the electrode formation region and the insulation layer
formation region.

20 8. A nitride semiconductor device according to claim 7,
wherein the insulating layer formation region comprises a
plurality of areas arranged on both sides of the electrode
formation region in a stripe, or a plurality of areas separated
by the electrode formation region.

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9. A nitride semiconductor device according to claim 1, wherein the semiconductor layer has a ridge and the first electrode is disposed on the upper surface of the ridge so that the nitride semiconductor device functions as a laser device.

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10. A nitride semiconductor device according to claim 9, further comprising a first insulating layer extending from the side surfaces of the ridge to the upper surface of the semiconductor layer and a second insulating layer extending from the upper surface of the first insulating layer to the side surfaces of the semiconductor layer, the second insulating layer being separate from the first electrode.

11. A nitride semiconductor device according to claim 10, further comprising an adhesion layer comprising a single-layer film or a multilayer film, wherein said adhesion layer is disposed on the surface of at least one of the first insulating layer and the second insulating layer.

12. A nitride semiconductor device according to claim 11, wherein the upper surface of the adhesion layer contains an element of the platinum group.

13. A nitride semiconductor device according to claim 11, wherein the upper surface of the adhesion layer comprises the

same material as the upper layer of the first electrode.

14. A nitride semiconductor device according to claim 11,
wherein the upper surface of the adhesion layer comprises Pt.

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15. A nitride semiconductor device according to claim 11,
wherein the adhesion layer is in contact with one of the upper
surface and the lower surface of the first electrode.

10 16. A nitride semiconductor device comprising:

a semiconductor layer;

a first electrode for establishing an ohmic contact disposed
on the semiconductor layer, the first electrode including an
upper layer and a lower layer and being subjected to heat

15 treatment; and

a second electrode formed on the first electrode, the second
electrode having a different shape from a shape of the first
electrode, the second electrode further including an upper layer
and a lower layer,

20 wherein the upper layer of the first electrode and the lower
layer of the second electrode comprise the same material and form
a joint region that joins the first electrode to the second
electrode.

25 17. A nitride semiconductor device according to claim 16,

wherein the lower layer of the first electrode comprises a material which is alloyable by heat treatment.

18. A nitride semiconductor device according to claim 16,
5 wherein the upper layer of the first electrode comprises an elemental metal of the platinum group or an alloyed material essentially composed of homologous elements in the platinum group.

19. A nitride semiconductor device according to claim 16,
10 wherein the lower layer of the second electrode comprises an elemental metal of the platinum group and an alloy including at least one of the platinum group metals.

20. A nitride semiconductor device according to claim 16,
15 wherein the upper layer of the first electrode comprises Pt.

21. A nitride semiconductor device according to claim 16,
wherein the lower layer of the second electrode comprises Pt.

20 22. A nitride semiconductor device according to claim 16,
wherein the surface of the semiconductor layer on which the first electrode is formed comprises an electrode formation region and an insulating layer formation region and the second electrode overlies the electrode formation region and the insulation layer
25 formation region.

23. A nitride semiconductor device according to claim 22,
wherein the insulating layer formation region comprises a
plurality of areas arranged on both sides of the electrode
5 formation region in a stripe, or a plurality of areas separated
by the electrode formation region.

24. A nitride semiconductor device according to claim 16,
wherein the semiconductor layer has a ridge and the first
10 electrode is disposed on the upper surface of the ridge so that
the nitride semiconductor device functions as a laser device.

25. A nitride semiconductor device according to claim 24,
further comprising a first insulating layer extending from the
15 side surfaces of the ridge to the upper surface of the
semiconductor layer and a second insulating layer extending from
the upper surface of the first insulating layer to the side
surfaces of the semiconductor layer, the second insulating layer
being separate from the first electrode.

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26. A nitride semiconductor device according to claim 25,
further comprising an adhesion layer comprising a single-layer
film or a multilayer film, wherein said adhesion layer is
disposed on the surface of at least one of the first insulating
25 layer and the second insulating layer.

27. A nitride semiconductor device according to claim 26,
wherein the upper surface of the adhesion layer contains an
element of the platinum group.

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28. A nitride semiconductor device according to claim 26,
wherein the upper surface of the adhesion layer comprises the
same material as the upper layer of the first electrode.

10 29. A nitride semiconductor device according to claim 26,
wherein the upper surface of the adhesion layer comprises Pt.

30. A nitride semiconductor device according to claim 26,
wherein the adhesion layer is in contact with one of the upper
15 surface and the lower surface of the first electrode.

31. A nitride semiconductor device comprising:

a semiconductor layer;

20 a first electrode for establishing an ohmic contact disposed
on the semiconductor layer;

a second electrode on the first electrode, having a
different shape from the shape of the first electrode; and

an insulating layer on the surface of the semiconductor
layer,

25 wherein the surface of the semiconductor layer on which the

first electrode is formed comprises an electrode formation region and an insulation layer formation region, and the second electrode overlies the electrode formation region and the insulating layer formation region.

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32. A nitride semiconductor device according to claim 31, wherein the insulating layer formation region comprises a plurality of areas arranged on both sides of the electrode formation region in a stripe, or a plurality of areas separated
10 by the electrode formation region.

33. A nitride semiconductor device according to claim 32, wherein the first electrode is disposed on the upper surface of the ridge so that the nitride semiconductor device functions as a
15 laser device.

34. A nitride semiconductor device according to claim 33, wherein the insulating layer includes a first insulating sublayer extending from the side surfaces of the ridge to the upper
20 surface of the semiconductor layer and a second insulating sublayer extending from the upper surface of the first insulating sublayer to the side surfaces of the semiconductor layer, the second insulating sublayer being separate from the first electrode.

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35. A nitride semiconductor device according to claim 34,
further comprising an adhesion layer comprising a single-layer
film or a multilayer film, wherein the adhesion layer is disposed
on the surface of at least one of the first insulating sublayer
5 and the second insulating sublayer.

36. A nitride semiconductor device according to claim 35,
wherein the upper surface of the adhesion layer contains an
element of the platinum group.

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37. A nitride semiconductor device according to claim 36,
wherein the upper surface of the adhesion layer comprises Pt.

38. A nitride semiconductor device according to claim 31,
15 wherein the semiconductor layer has a ridge and the first
electrode is disposed on the upper surface of the ridge so that
the nitride semiconductor device functions as a laser device.

39. A nitride semiconductor device according to claim 38,
20 wherein the insulating layer includes a first insulating sublayer
extending from the side surfaces of the ridge to the upper
surface of the semiconductor layer and a second insulating
sublayer extending from the upper surface of the first insulating
sublayer to the side surfaces of the semiconductor layer, the
25 second insulating sublayer being separate from the first

electrode.

40. A nitride semiconductor device according to claim 39,
further comprising an adhesion layer comprising a single-layer
5 film or a multilayer film, wherein the adhesion layer is disposed
on the surface of at least one of the first insulating sublayer
and the second insulating sublayer.

41. A nitride semiconductor device according to claim 40,
10 wherein the upper surface of the adhesion layer contains an
element of the platinum group.

42. A nitride semiconductor device according to claim 41,
wherein the upper surface of the adhesion layer comprises Pt.

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